



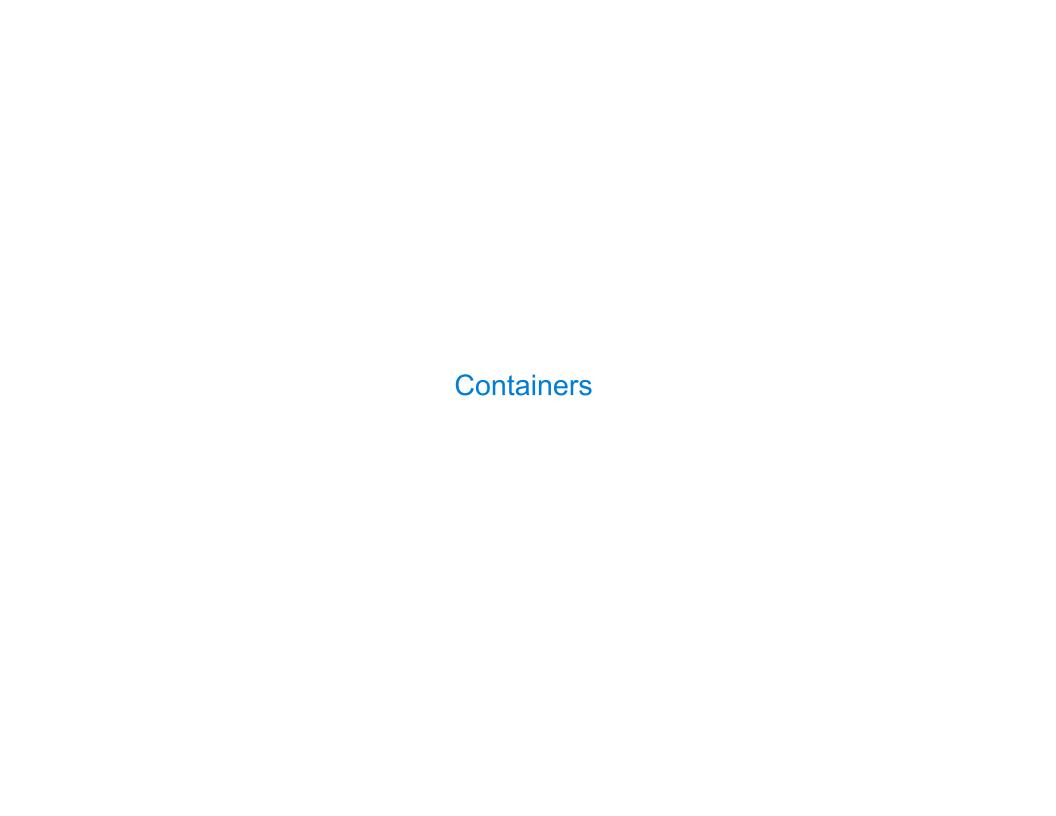
# Lists

['Demo']

### Working with Lists

```
>>> digits = [1, 8, 2, 8]
                                            >>> digits = [2//2, 2+2+2+2, 2, 2*2*2]
The number of elements
    >>> len(digits)
An element selected by its index
    >>> digits[3]
                                            >>> getitem(digits, 3)
Concatenation and repetition
    >>> [2, 7] + digits * 2
                                            >>> add([2, 7], mul(digits, 2))
    [2, 7, 1, 8, 2, 8, 1, 8, 2, 8]
                                            [2, 7, 1, 8, 2, 8, 1, 8, 2, 8]
Nested lists
    >>> pairs = [[10, 20], [30, 40]]
    >>> pairs[1]
    [30, 40]
    >>> pairs[1][0]
    30
```

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### Containers

Built-in operators for testing whether an element appears in a compound value

```
>>> digits = [1, 8, 2, 8]
>>> 1 in digits
True
>>> 8 in digits
True
>>> 5 not in digits
True
>>> not(5 in digits)
True
```

(Demo)

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## For Statements

(Demo)

### Sequence Iteration

```
def count(s, value):
    total = 0
    for element in s:

        Name bound in the first frame
        of the current environment
            (not a new frame)

        if element == value:
            total = total + 1
        return total
```

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#### For Statement Execution Procedure

- 1. Evaluate the header <expression>, which must yield an iterable value (a sequence)
- 2. For each element in that sequence, in order:
  - A. Bind <name> to that element in the current frame
  - B. Execute the <suite>

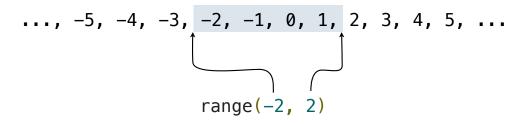
### **Sequence Unpacking** in For Statements

```
A sequence of
                  fixed-length sequences
>>> pairs = [[1, 2], [2, 2], [3, 2], [4, 4]]
>>> same count = 0
     A name for each element in a
                                       Each name is bound to a value, as in
         fixed-length sequence
                                       multiple assignment
>>> for(x, y) in pairs:
        if x == y:
            same_count = same_count + 1
>>> same_count
```



### The Range Type

A range is a sequence of consecutive integers.\*



**Length:** ending value - starting value

(Demo)

Element selection: starting value + index

<sup>\*</sup> Ranges can actually represent more general integer sequences.

## List Comprehensions

```
>>> letters = ['a', 'b', 'c', 'd', 'e', 'f', 'm', 'n', 'o', 'p']
>>> [letters[i] for i in [3, 4, 6, 8]]

['d', 'e', 'm', 'o']
```

### List Comprehensions

```
[<map exp> for <name> in <iter exp> if <filter exp>]
Short version: [<map exp> for <name> in <iter exp>]
```

A combined expression that evaluates to a list using this evaluation procedure:

- 1. Add a new frame with the current frame as its parent
- 2. Create an empty result list that is the value of the expression
- 3. For each element in the iterable value of <iter exp>:
  - A. Bind <name> to that element in the new frame from step 1
  - B. If <filter exp> evaluates to a true value, then add the value of <map exp> to the result list

**Example: Promoted** 

#### First in Line

Implement **promoted**, which takes a sequence  $\mathbf{s}$  and a one-argument function  $\mathbf{f}$ . It returns a list with the same elements as  $\mathbf{s}$ , but with all elements  $\mathbf{e}$  for which  $\mathbf{f}(\mathbf{e})$  is a true value ordered first. Among those placed first and those placed after, the order stays the same.